BurnerMate Universal Operator Manual

Standard LCD Display

Color Touch Screen Operator Interface Terminal

BurnerMate Universal Fully Metered Chassis

UV, IR Self Check Scanners

Communication Station

Oxygen Probe

Servo Motor Actuator

CONTENTS

INTRODUCTION

The Preferred **BurnerMate Universal (BMU)** combines flame safeguard, first out annunciation, and combustion control into one controller. It can also provide feedwater control, draft control, and many other common boiler control features. Combustion control can be a jackshaft system, parallel positioning, or parallel positioning with oxygen trim. The controller is customized for each application by parameter selection done during commissioning. These parameters are password protected to prevent unwanted changes.

HARDWARE DESCRIPTION

The **BurnerMate Universal** (**BMU**) consists of a control chassis, an LCD keypad for operator interface, one or two flame scanners, and high precision servos to drive fuel valves, air dampers, and other devices. The BMU system may include a 10" color touchscreen to provide a more complete, and easier to read view of burner operations.

BMU Chassis

The BMU chassis houses the microprocessors that are the brains of the system. Field devices are wired to the chassis using the orange quick-disconnect terminal strips. The terminal strips closest to the enclosure sub-base connect to the flame safeguard board. These terminals are numbered 1 through 99 and are 120 VAC. The next board up is the combustion control board. It houses terminals 100 through 148. These are low voltage (24VDC or less) terminals. If the BMU is doing feedwater control, draft control, or fuel flow monitoring, it will contain a third board for these inputs. If not, the openings on the chassis cover will have metal cover plates over them.

LCD Keypad

The LCD keypad is the primary interface for the controller. Required on all BMU systems, anything you need to do with the BMU system can be done through the LCD keypad. In addition to being the primary operator interface to the controller, the keypad contains the backup EEPROM memory used to restore controller configuration information in the event the primary EEPROM memory in the BMU chassis gets corrupted.

Flame Scanner(s)

Most BMU systems are supplied with Preferred flame scanners. They are available in ultraviolet (UV), infrared (IR), and ultraviolet self-checking (UVSC) versions. Preferred flame scanners are different than most flame scanners because the flame amplifier is in the scanner housing, not in the flame safeguard processor. When the Preferred scanner sees flame, it closes a 120 VAC relay contact wired back to the BMU that tells the processor the scanner sees flame. The LED on the right side of the scanner lights up when the scanner sees flame. It also outputs a 4-20 mA analog signal back to the BMU chassis proportional to flame signal strength.

The left-hand LED blinks in proportion to the flame signal. This can be used to help sight the scanner or diagnose a flame scanning problem. All Preferred scanners include a military-style quick disconnect that allows you to quickly remove or replace the scanner without disconnecting any wires.

The UV self-checking scanners include a shutter mechanism that closes every ten seconds. If the scanners sees a reduction in flame signal, the left LED flashes green and the scanner continues running. If the scanner closes the shutter and the flame signal stays constant, the scanner may have failed showing flame (a runaway scanner). The left hand LED will turn red and the flame proven contact will open, causing the BMU to execute a flame fail lockout.

High Precision Servos

Fuel valves, the forced draft fan damper, and other burner devices will be driven by electric servos. These servos contain feedback potentiometers to ensure the servos are always in the position dictated by the BMU command signal. The servos are available in a wide range of torques, depending on the torque required to drive the device. Servos are connected to the driven device by a shaft coupling that should be drilled and pinned to avoid slippage.

Color Touchscreen

Some BMU systems include a color touchscreen for operator interface. The touchscreen is powered by a 24 VDC power supply in the BMU enclosure and communicates to the BMU chassis by Modbus digital protocol. Most operator functions can be performed using the touchscreen, and many useful graphic pages are included to aid in operations, trouble-shooting, and trending.

FEATURE DESCRIPTION

The **BMU** is capable of performing a large variety of control functions that are enabled or disabled by parameter selection. The following features are available, but most will not be enabled for your application.

Emergency Stop (Included/Not Included)

The Emergency Stop contact on terminal 29 is used to quickly shutdown the burner when the operator detects an unsafe operating condition. The BMU generates a lockout condition and energizes the common alarm contacts. The emergency stop must be disengaged and the BMU reset through the LCD keypad before the burner can be started again.

Servo Tests (All BMU systems)

Fuel, Air and FGR servos are stroke tested from minimum to maximum position during every burner start-up. This is done to ensure all servos are working properly and the burner is safe to run.

Fuel Selection (by LCD keypad or by fuel selector switch)

Fuel selection can be done on the LCD keypad, or through a traditional selector switch depending on how your system has been configured. To select the fuel through the LCD keypad, press the Back and Next buttons at the same time, then press Next until you see the screen below. Press Enter and then the Up button to change the "No" to a "Yes" for the fuel you want to fire. Only one fuel can be selected or fired at a time.

Low Fire Fuel Transfer (Enabled/Disabled)

This option implements NFPA 85 Section 5.7 procedures for Single Burner Simultaneous Firing of Two Fuels for Fuel Transfer Only. A new fuel can be selected while the burner is operating in the Release to Modulate mode. The fuel transfer method is selected as either Restart or Low Fire (fuel changeover on-the-fly). The BurnerMate Universal will automatically sequence the burner through a safe fuel changeover, oil to gas, or gas to oil.

FD Fan Variable Speed Changeover to Fixed Speed Bypass (Enabled/Disabled)

There are two separate and very different sets of combustion curves for 60 Hz fixed speed Forced Draft (FD) Fan operation versus Variable Speed Drive (VSD) operation. If a VSD fails during burner operation, the BMU will trip the burner. The operator then puts the VSD into Bypass (fixed speed) mode, and then restarts the burner. In VSD bypass mode the BMU will run on a separate set of combustion curves for 60 Hz fan operation until the VSD can be repaired.

SAFETY FEATURES AND OPTIONAL FUNCTIONS

Dual Flame Scanners (Enabled/Disabled)

The BurnerMate Universal can be configured for a second scanner that can be used to provide redundant flame safety and allow for individual scanner maintenance without tripping the burner. In dual scanner mode, either flame scanner can see flame and keep the burner running.

Individual Limit Annunciation (All BMU models)

The BurnerMate Universal monitors and annunciates up to 6 recycling limit inputs and up to 33 non-recycling limit inputs. All burner limits are 120 VAC contacts, wired in parallel for easy troubleshooting and individualized annunciation. The first-out annunciation messages appear on the bottom of most LCD keypad screens and color touchscreen graphic pages.

Lockout and Alarm History (All BMU models)

When the BurnerMate Universal initiates a lockout, it saves a "snapshot" of 166 boiler/burner variables. This data can be viewed for the previous 10 burner lockouts by accessing the Lockout History via the LCD touch pad. To access the Lockout Snapshot information, press the Up and Down buttons at the same time to access the main menu, then press Next. The most recent lockout will be shown. Press Enter and arrow down to access previous lockout. Cursor down to the 0), press Enter, and arrow down to access more information for each lockout.

Automatic Gas SSOV Leak Test (Enabled/Disabled)

Gas safety shutoff valve leak testing can be performed automatically. This feature can be used with or without a vent valve between the two SSOVs. If enabled the SSOV leak test is performed after each time the burner shuts down.

MAF and PAF Safe Start Check (All BMU models)

Unless the FD Fan is in the manual run mode, the BMU checks to make sure the minimum air flow switch (and purge air flow switch, if enabled) is open. These switches should not be made before the F.D. fan is energized. If the BMU detects these switches are jumpered, it will wait for the switch contacts to open and then Lockout.

Automatic Oil Gun Post Purge (Enabled/Disabled)

Oil gun purging helps minimize the admission of unburned oil into the furnace after burner shutdown. The BurnerMate Universal supports two methods of oil gun purge: safely purging oil into the furnace with the pilot flame on ("BlowThru"); or energizing a scavenging pump to pull the oil back out of the oil gun ("Pumpback"). Automatic Oil Gun Post Purge is functional during the Low Fire Fuel Changeover when the new fuel selected is gas.

Nuisance Trip Protection (Enabled/Disabled)

To prevent nuisance shutdowns, a technician can enable time delays of up to four seconds for the following burner limits: minimum airflow, low fuel pressure, low atomizing steam flow, etc. Similar to the flame failure response time of a flame scanner, these adjustable time delays will allow the BMS to "ride through" intermittent "opening" of these external limits. The fuel specific limit delays (HOP, LOP, LGP, HGP, LG3P, and HG3P) are only in effect immediately after opening the SSOVs.

High Flue Gas Temperature Shutdown (Enabled/Disabled)

The BurnerMate Universal can monitor flue gas temperature, and if it exceeds a user-defined set point, the BMS initiates a trip. This serves as an additional protection against firing a "dry" boiler.

SAFETY FEATURES AND OPTIONAL FUNCTIONS

Five Configurable Auxiliary Relays (Disabled/Enabled)

 Up to five auxiliary relays can be configured for a variety of uses. Common alarm, auxiliary fan start, oil auxiliaries, gas auxiliaries, common auxiliaries, hot water pump start, LWC blowdown valve, flame on, limits made, fuel valves open, etc. The wiring schematic will tell you which auxiliary relays are in use and what devices they are powering.

Flue Gas Oxygen Trim (Disabled/Enabled)

Flue gas oxygen measurement is used to continuously adjust (trim) the fuel/air ratio. Oxygen trim saves fuel by fine-tuning the burner to operate safely and reliably at reduced excess air levels throughout the burner firing range. It also allows the controller to compensate for external environmental changes that affect burner stoichiometry (i.e. ambient temperature, fuel heating value, viscosity, etc.). Low flue gas oxygen can be elected to shutdown the burner after an adjustable time delay.

Variable Speed Drive FD Fan Control (Disabled/Enabled)

The BurnerMate Universal maximizes VSD electrical energy savings by allowing the user to maintain the FD Fan Damper at 100% open from high fire down to approximately 40% (field adjustable). From 40% firing rate down to minimum fire, the FD Fan damper ramps from full open to partially closed to assure the maximum burner turndown is achieved.

Atomizing Media Pressure Control (Disabled/Enabled)

The Atomizing Media Pressure Control option compares current atomizing pressure versus the "commissioned" atomizing pressure curve (Atomizing Pressure vs. Fuel Valve Position) and PID control will modulate the control servo. An external Atomizing Pressure Transmitter is required for use of this option.

Combustion Efficiency Calculation and Display (Disabled/Enabled)

A "Combustion Efficiency by Losses" computation based on Flue Gas Oxygen and Flue Gas Temperature is implemented and the results displayed on the LCD. This is available for Oil (Fuel 1) and Gas (Fuel 2).

Firing Rate Set Point (All BMU models)

The BurnerMate Universal can operate in the "Manual" mode, in which the firing rate is determined by the operator, or the operator can input a pressure or temperature set point, and the BurnerMate Universal will "automatically" use PID control to maintain that set point. A firing rate or set point signal can also be input remotely, either through a wired contact or Modbus.

Call for Heat (Setpoint Deviation or Operating Pressure/Temperature Switch)

The call for heat start and stop command is determined either by local set point deviation or a remote input. When set point deviation is selected, the BurnerMate Universal will generate a call for heat when the fired equipment is a user-defined temperature (or pressure) below the firing rate set point. Alternatively, the call for heat is removed when the boiler outlet conditions are a user-defined value above the firing rate set point. The remote start/stop command choice is determined by a parameter selection.

Outdoor Air Temperature Reset (Disabled/Enabled)

The BurnerMate Universal saves energy by lowering a hot water boiler's exit temperature set point when the outside air temperature increases. Operating cost is greatly reduced during warmer days. When desired, the operator can also set the boiler water temperature set point manually.

SAFETY FEATURES AND OPTIONAL FUNCTIONS

Domestic Hot Water Override (Disabled/Enabled)

Some boilers are used primarily for building space heating, but they also provide heat for domestic hot water (DHW) tanks. When the outdoor weather is warm, there may be no space-heating load, and the boilers will shut down.

Another possible scenario is that the outdoor reset set point has dropped so low (due to warm weather) that the DHW cannot be heated sufficiently. The DHW override feature forces the exit water temperature set point to be greater than or equal to the DHW set point.

The DHW start logic overrides the remote CFH, the OAT cutoff set point, and the Building Automation System disable input.

Warm Standby Option (Disabled/Enabled)

Some boiler installations, such as those for manufacturing plants, research facilities and medical facilities, cannot tolerate a sustained low header pressure (or temperature). Larger boilers require a long slow warm-up cycle. Therefore, some facilities require that one or more boilers be kept on "Warm Standby."

Warm Standby boilers are periodically fired at low fire until their pressure (or temperature) is almost as high as the operating pressure, and then the boilers are shut down. When the pressure drops to a lower threshold, the cycle repeats. If a boiler is kept warm, it can rapidly be brought up in firing rate as needed.

When this option is selected, the Warm Standby logic starts and stops the boilers using a boiler shell temperature (or pressure) switch or the boiler outlet temperature (or pressure) sensor by comparing this signal against user-determined start and stop set points.

Cold Start Warm-Up Cycle Option (Disabled/Enabled)

Because of the stress created by thermal expansion, some boilers require a slow warm-up if the boiler is cold. The firing rate Cold Start Warm-up Cycle Option steps the firing rate up in stages in response to the boiler outlet temperature (or pressure). An override timer can cause the firing rate to increase to the next firing rate step, even if the boiler outlet temperature (or pressure) has not yet reached the step set point. Consult the boiler manufacturer for the proper firing rate and set point step sizes and the proper override time for your particular boiler.

An in-progress warm-up cycle can be cancelled by placing the firing rate "Auto/Manual" push button in "Manual". This cycle occurs only once per boiler start-up.

The cold start warm-up cycle ends automatically, and the PID logic begins modulating the burner if the boiler outlet conditions exceed a field selectable value or are equal to the firing rate set point.

SAFETY FEATURES AND OPTIONAL FUNCTIONS

Burner Light-off Low Fire Hold (Disabled/Enabled)

To minimize thermal stresses, some boilers require that the burner hold at low fire (0%) after light off. The BurnerMate Universal will release the burner to modulate when the boiler shell temperature (or pressure) increases to set point or the Low Fire Hold Override Timer times out. This cycle occurs only once per boiler start-up. The Cold Start Warm-up Cycle Option overrides the Burner Light-off Low Fire Hold. If the Warm Standby Option is the only CFH, the firing rate demand will remain at low fire. The temperature is measured by a boiler shell temperature (or pressure) sensor or a boiler water temperature (or pressure) switch, depending on the option selected.

Integrated Draft Control (Disabled/Enabled)

The BurnerMate Universal can perform simple proportional floating draft control, or PID draft control with firing rate feedforward. It also supports field selectable boiler outlet damper Servo or 4-20 mA actuator control, ID Fan Variable Speed Drive (VSD) control, or combined damper and VSD control. Open damper or adjustable starting draft options are also selectable.

Drum Level -- Feedwater Control (Disabled/Enabled)

User-configurable one, two, or three-element drum level control can be accomplished using a servo feedwater valve, 4-20 mA control valve, or feedwater pump VSD control.

Automatic Low Water Cutout Blowdown (Disabled/Enabled)

For steam boilers, the user can select the time of day for automatic blowdown, the duration, and a minimum steam drum pressure required to perform automatic blowdown. An alarm or a lockout can also be configured to occur if a low water cutout doesn't open during the blowdown.

LCD KEYPAD OPERATION

The LCD keypad has five home screens that display useful burner information and control functions. You can access the Home screens by pressing the Back and Next buttons at the same time. The Back or Next button allows you to scroll through these five screens arranged in a loop.

The first screen is the flame safeguard screen. It displays the current flame signal(s), which fuel is selected, which BMS state the burner is in (standby, modulate, post purge, etc.) The bottom line of this screen displays the most up to date information on the controller.

Pushing the Next button makes the boiler information screen appear. The first line displays the boiler outlet pressure or temperature. If controlling a heater or dryer, the boiler outlet will display the exit temperature of the heater. The second line displays the current setpoint in psig or degrees. The third line displays the firing rate in percent, whether the firing rate is in Auto or Manual, and whether control of the burner is in Local or Remote. Putting the cursor on any variable on this line and pressing Enter allows you to change that value. The bottom line of this screen displays the most up to date burner information, the same as the flame safeguard screen.

Pushing the Next button again makes the servo information screen appear. This screen displays the current position of all the servos (in degrees), the firing rate (in percent), VSD speed (in Hz if enabled), flue gas temperature (in degrees if enabled), stack oxygen (in percent, if enabled). Note the down arrow in the right corner of the screen. This indicates there is more information on this screen than can be displayed, use the Down arrow to access this information.

Pushing the Next button again takes you to the lockout and alarm screen. By putting the cursor on ALL ITEMS and pressing Enter, you can arrow down and see ALL ITEMS, LOCKOUTS, or LOCKOUT & ALARM. Arrow the cursor down to the date on the second line and press Enter to scroll through the ten most recent lockouts or alarms. Note, this screen provides historical information. Even after you clear an alarm condition and reset the controller, this screen will display historical (not current) alarm or lockout information.

Pushing the Next button again takes you to the fuel select screen. All the possible fuel selections will be shown on the left hand side. Arrow to the fuel you want to fire and press Enter to change the No to Yes to select a particular fuel. Note, even if the burner is configured for just one fuel, it may be necessary to select that fuel to Yes to fire.

Pushing the Next button again takes you back to the flame safeguard screen.

LCD KEYPAD OPERATION

Lockout Snapshot

Pushing the Up and Down arrows at the same time takes you to the Main Menu. Most of the screens in the main menu are technician level screens. However, the top entry in the main menu, the Lockout Snapshot, contains a powerful diagnostic tool that tells you everything the controller knew at the time of the last ten lockouts.

To access this screen, move the cursor to Lockout Data and press Next. The screen is now displaying the date, time, and first out annunciation message for the most previous lockout.

Press Enter and the Down arrow to access the last ten lockout starting with the most recent. The third line down in this screen will read:

0) LOCKOUT

This means for the lockout that occurred at the date and time above, the Lockout reason (first out annunciation message) is displayed below. You can put the cursor on the 0), press Enter and arrow down to access:

1)   BMS State

You can change the 0 to any number from 0 to 166 to display 166 different pieces of information saved during this Lockout.

A table of the 166 pieces of information is provided on the next page. This information can be extremely useful to diagnose the reason a Lockout occurred.

Press ESC to exit this screen and go back to Main Menu.

Lockout Data

1 BMS State	46 Feed Pump VSD SP
2 Commission Mode	47 Oil Flow
3 Selected Fuel	48 Gas Pressure
4 Firing Rate %	49 Gas Flow
5 Scanner 1	50 Fuel 3 Flow
6 Scanner 2	51 Curve Oil Flow
7 Oxygen	52 Curve Gas Flow
8 O2 Trim PID SP	53 Curve Fuel 3 Flow
9 O2 Trim	54 Curve Air Flow
10 Scaled Air Trim	55 Air Flow Temperature
11 Boiler Outlet Temp/Press	56 Air Flow
12 Shell Temp	57 Air Flow, O2 Trimmed
13 Atomizing Pressure	58 Air Flow SP
14 Atomizing SP	59 Air Flow Trim
15 Draft	60 Air Flow Trim Manual Cmd
16 Drum Level	61 Windbox Oxygen
17 Steam Flow	62 Windbox Oxygen Setpoint
18 Feedwater Flow	63 Unscaled FGR Trim
19 Fuel Demand deg	64 Scaled FGR Trim
20 Oil Servo SP	65 Password Level
21 Oil Servo FB	66 Firing Rate PID SP
22 Gas Servo SP	67 Remote Firing Rate
23 Gas Servo FB	68 Remote SP
24 Fuel 3 Servo SP	69 OA Sensor Bad
25 Fuel 3 Servo FB	70 Modbus Comm Bad
26 FD Servo SP	71 Remote SP/FR mA In Bad
27 FD Servo FB	72 Cold Junction Error
28 FD VSD Hz SP	73 O2 A/D Error
29 FD VSD Hz FB	74 O2 Cell Open or Combustibles
30 Aux Servo SP	75 O2 Test Relay Error
31 Aux Servo FB	76 O2 Cell Temp
32 FGR Cutback	77 O2 Cell mV
33 FGR Servo SP	78 Flue Temp
34 FGR Servo FB	79 O2 Cell Ohms
35 Aux 2 SP	80 Fuel Transfer
36 Aux 2 FB	81 ALWC with Bypass
37 Jackshaft Servo SP	82 Oil SSOV Open
38 Jackshaft Servo FB	83 Gas SSOV Open
39 Atomizing Valve SP	84 Fuel 3 SSOV Open
40 Atomizing Valve FB	85 HF3P TDR
41 Draft Damper SP	86 HGP TDR
42 Draft Servo FB	87 HOP TDR
43 Draft VSD SP	88 LASF TDR
44 Feedwater Valve SP	89 LDCO TDR
45 Feedwater Servo FB	90 LF3P TDR

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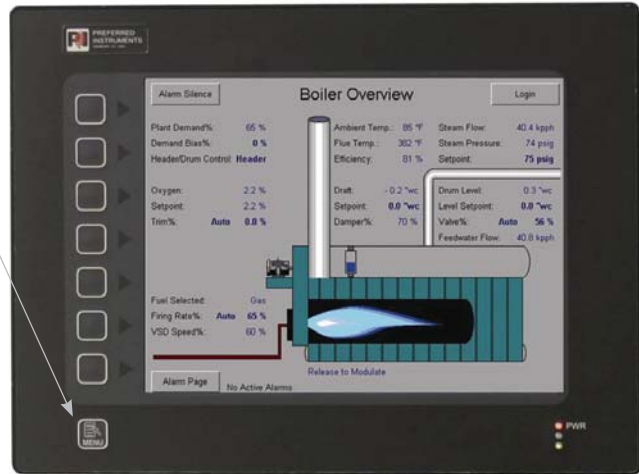
Lockout Data

91 LGP TDR	135 DI.26 Fuel 3 Select
92 LOP TDR	136 DI.27 Fuel 3 HP
93 LWC with Bypass	137 DI.28 Fuel 3 LP
94 MAF TDR	138 DI.29 E Stop
RO.xx Safety Relay	139 DI.30 Scanner 1
95 RO.51 Ign Xfmr	140 DI.31 Scanner 2
96 RO.52 Pilot	141 DI.32 High Limit
97 RO.53 Atomizing	142 DI.33 MAF
98 RO.54 Oil SSOV	143 DI.34 FD Fixed Starter
99 RO.55 Oil Gun Purge	144 DI.35 FD VSD Starter
100 RO.56 Gas SSOV	145 DI.36 LLWC
101 RO.57 Fuel3 SSOV/LT DownStr SSOV	146 DI.37 HWC
102 RO.58 Gas Vent	147 DI.38 LDCO/HFP
103 RO.59 FD Fan	148 DI.39 ID Starter
104 RO.61 Lockout	149 DI.40 FGR Starter
105 RO.62 Option 1	150 DI.41 Non-Recycle Spare 1
106 RO.63 Option 2	151 DI.42 Non-Recycle Spare 2 / HLTP
107 RO.66 Option 3	152 DI.43 Non-Recycle Spare 3 / LLTP
108 RO.69 Option 4	153 DI.44 Draft Damper Open
109 RO.72 Option 5	154 DI.45 Null Windbox O2 FGR Trim
110 DI.1 Ext Reset	155 DI.46 PAF
111 DI.2 Alt SP	156 DI.47 Oil SSOV POC
112 DI.3 FD Fan Type	157 DI.48 Gas SSOV POC
113 DI.4 LWC Bypass PB	158 DI.49 Fuel 3 POC/Gas SSOV2 POC
114 DI.5 Low-Low Water Alm	159 ROFB Safety Relay
115 DI.6 High Water Alm	160 ROFB.51 Ign. Xfmr
116 DI.7 WarmUp or DHW	161 ROFB.52 Pilot
117 DI.8 Local CFH	162 ROFB.53 Atomizing
118 DI.9 Remote CFH	163 ROFB.54 Oil SSOV
119 DI.10 Burner On/Off	164 ROFB.55 Oil Gun Purge
120 DI.11 Oper Limit	165 ROFB.56 Gas/Fuel
121 DI.12 LWC	166 ROFB.57 Fuel3 SSOV/LT DownStr SSOV
122 DI.13 Low Water Flow	
123 DI.14 Fresh Air Open	
124 DI.15 Recycle Spare 1	
125 DI.16 Oil Fuel Select	
126 DI.17 HOP	
127 DI.18 LOP	
128 DI.19 LASP	
129 DI.20 LASF	
130 DI.21 HOT or LOT	
131 DI.22 Oil Gun In Place	
132 DI.23 Gas Fuel Select	
133 DI.24 HGP	
134 DI.25 LGP	

BMU TOUCHSCREEN OPERATION

The BMU touchscreen communicates with the BMU chassis via an electronic communication protocol called Modbus. The graphics pages on the touchscreen are loaded into the touchscreen memory, but the data comes from the BMU chassis. Changes can be made to the controller through either the LCD keypad or the color touchscreen.

All the graphic pages on the touchscreen can be accessed by pushing the Menu button in the bottom left hand corner. That will pull up the following screen. Your choices then are:
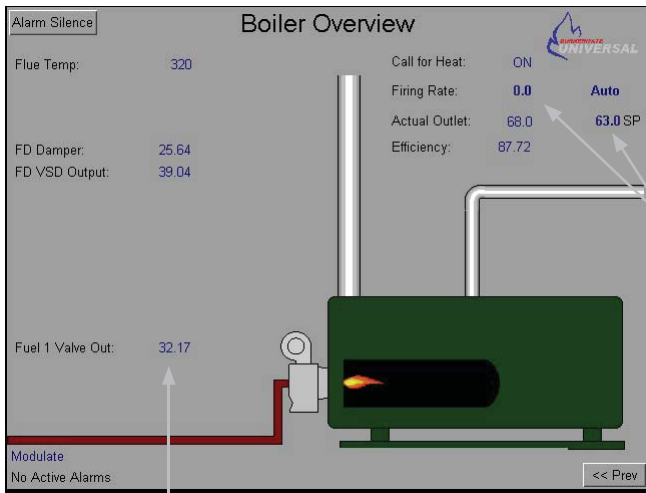
Boiler Overview
Control Panel Loop
Trending Loop
Setup Menu
Blank Page
Screen Cleaning
Alarm Page

Color Touch Screen
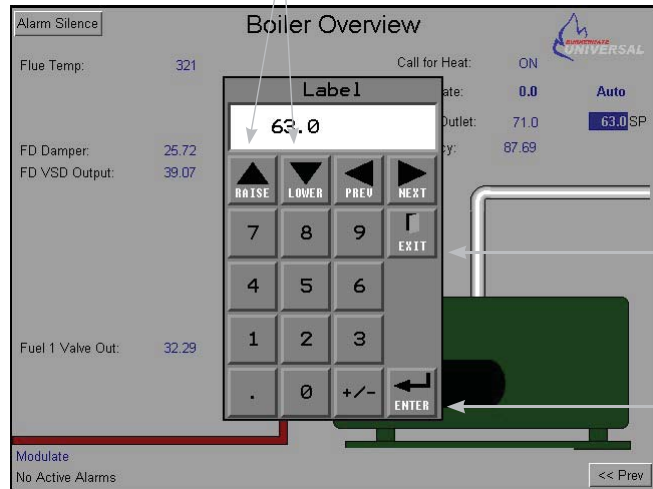**Operator Interface Terminal**

Boiler Overview Screen

The boiler overview screen is the most useful graphics page for operators. It provides all the current information on the combustion equipment fired.

Values in light blue are read only, but values in dark blue bold print can be changed. To change any value, double-tap on the value and a menu screen will pop up. For values like Auto/Manual selection, a pull-down menu will appear.

Use the Raise or Lower arrows to select the value you want and then press Enter.

If you want to return to the previous screen without making a change (and want the pop-up menu to go away) press Exit. For numerical values, a numerical keypad will pop up. Either type in the number you want the value to be, or use the Raise and Lower buttons to change the value. Again, push the Enter button to accept the changed value, or the Exit button if you change your mind.

BMU TOUCHSCREEN OPERATION
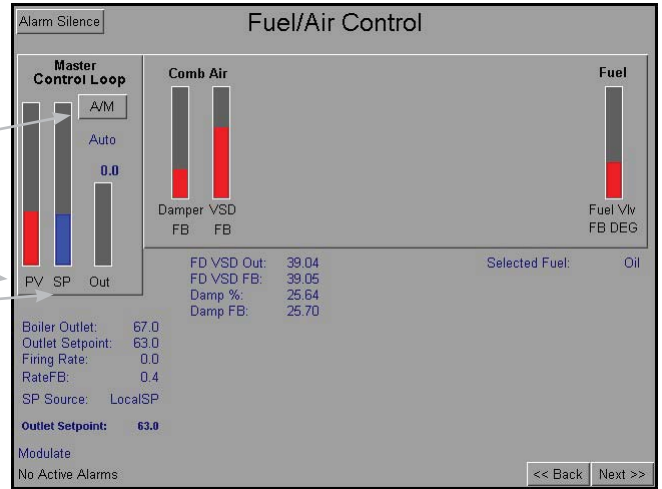
Control Panel Loop

This graphic page provides a traditional loop controller faceplate for each of the control loops configured for your BMU application.

A/M is used for the auto/manual pushbutton.

PV stands for process variable

SP stands for setpoint

The bar graphs tell you the value for each of the variables. Depending on the control loop selected, you can change the setpoint, toggle the controller from auto to manual and back, and change the output value when in manual.

Pushing the <<Back or Next>> buttons at the bottom right of the screen will scroll you through all of the control loops that have been enabled.

Trending Loop Screen

The BMU provides the capability to configure up to eight trending screens, which work like paperless recorder screens. Virtually any analog value in the controller can be trended on as many screens as you want. The values, or traces, appear at the bottom of the screen the same color as the trace on the graph. The eight trend screens can be configured by pushing the scaling buttons at the top right hand corner of each screen. The screen labeled Graph/Trend Scaling lists all the available analog inputs in rows on the left hand side. Turn each value on and off using the buttons under the Trend # column on the right hand side. You can set minimums and maximums for some of the traces on the left hand columns. Push the <<Prev button on the bottom right hand of the setup screen to go back to the trend screen.

Once you have a screen set up, the << and < buttons take you back in time, the > and >> buttons take you forward in time, and the In and Out buttons zoom in and out of the screen. Note the time and date stamp in the top right and left corner of the screen. If you tap the screen at a particular point in the trend, a white line appears and the time corresponding to that data appears at the bottom of the screen. The values at the bottom of the screen become locked into that time. As the trend recorder continues to catch more data, this line will move to the left of the screen and eventually go away. Press the LIVE button to have the recorder go back to reading current values.

*The trend screens only show and archive data. You can't change any controller operating parameters from these screens.

Setup Menu Screen

The Setup Menu screen is used primarily during controller commissioning, with one important exception. The System I/O screens accessed through the Setup Menu provide important information on all the inputs and outputs to the BMU controller.

Alarm Silence
You Are Here: Setup Menu

Setup Menu

System Setup — Task 1: System Setup
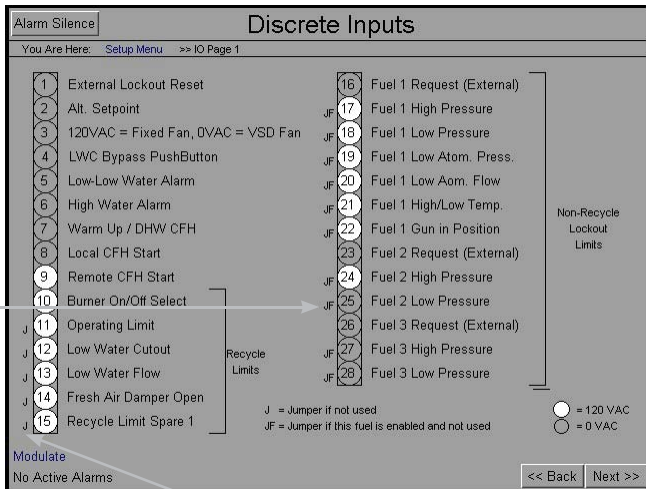Servos — Task 2: Servo Overview
System I/O — Task 3: Pre-Start I/O Checks
Application Setup — Task 4: Application Setup
Parameter Setup — Task 5: Parameter Setup
Curve Setup — Task 6: Curve Setup
Tuning — Task 7: PID Tuning

** COMPLETE **
Application Setup
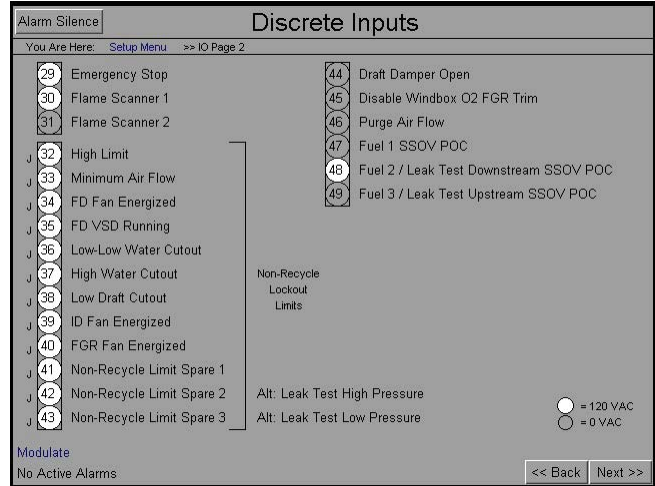before Parameters

Alarm Page   Servo Check
No Active Alarms

When you press the System I/O button, you will be taken to the Discrete Inputs screen. This first screen shows the status of BMU terminals 1 through 28. These are all 120 VAC digital inputs. If the terminal is hot (120 VAC) the terminal color changes to white.

Alarm Silence
You Are Here: Setup Menu   >> IO Page 1

Discrete Inputs

1 External Lockout Reset
2 Alt. Setpoint
3 120VAC = Fixed Fan, 0VAC = VSD Fan
4 LWC Bypass PushButton
5 Low-Low Water Alarm
6 High Water Alarm
7 Warm Up / DHW CFH
8 Local CFH Start
9 Remote CFH Start
10 Burner On/Off Select
J 11 Operating Limit
J 12 Low Water Cutout
J 13 Low Water Flow
J 14 Fresh Air Damper Open
J 15 Recycle Limit Spare 1

16 Fuel 1 Request (External)
JF 17 Fuel 1 High Pressure
JF 18 Fuel 1 Low Pressure
JF 19 Fuel 1 Low Atom. Press.
JF 20 Fuel 1 Low Aom. Flow
JF 21 Fuel 1 High/Low Temp.
JF 22 Fuel 1 Gun in Position
23 Fuel 2 Request (External)
JF 24 Fuel 2 High Pressure
JF 25 Fuel 2 Low Pressure
26 Fuel 3 Request (External)
JF 27 Fuel 3 High Pressure
JF 28 Fuel 3 Low Pressure

Recycle Limits

Non-Recycle Lockout Limits

J = Jumper if not used
JF = Jumper if this fuel is enabled and not used

= 120 VAC
= 0 VAC
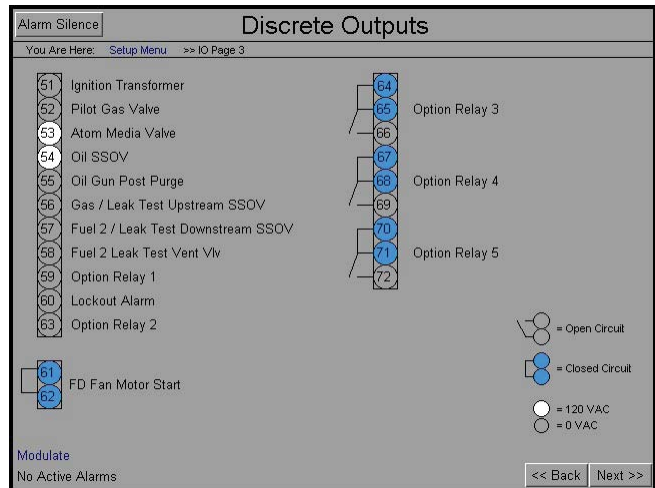
Modulate
No Active Alarms   << Back   Next >>

Terminals with a small J to their left are terminals that need to be hot for the BMU to allow the burner to run. Terminals with a JF label must be hot if that fuel is configured in the BMU system. With the BMU, fuel 1 is oil, fuel 2 is natural gas, and fuel 3, when configured, is usually a second gas fuel.
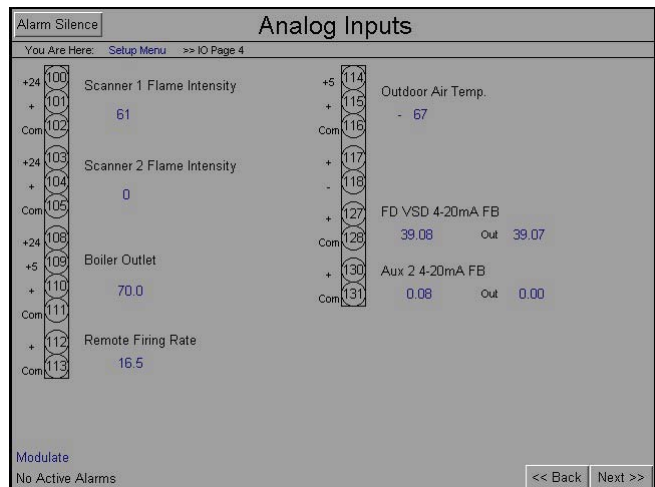
Push the Next button to see discrete input terminals 29 through 49.

Alarm Silence
You Are Here: Setup Menu   >> IO Page 2

Discrete Inputs

29 Emergency Stop
30 Flame Scanner 1
31 Flame Scanner 2
J 32 High Limit
J 33 Minimum Air Flow
J 34 FD Fan Energized
J 35 FD VSD Running
J 36 Low-Low Water Cutout
J 37 High Water Cutout
J 38 Low Draft Cutout
J 39 ID Fan Energized
J 40 FGR Fan Energized
J 41 Non-Recycle Limit Spare 1
J 42 Non-Recycle Limit Spare 2
J 43 Non-Recycle Limit Spare 3

44 Draft Damper Open
45 Disable Windbox O2 FGR Trim
46 Purge Air Flow
47 Fuel 1 SSOV POC
48 Fuel 2 / Leak Test Downstream SSOV POC
49 Fuel 3 / Leak Test Upstream SSOV POC

Non-Recycle Lockout Limits

Alt: Leak Test High Pressure
Alt: Leak Test Low Pressure

= 120 VAC
= 0 VAC

Modulate
No Active Alarms   << Back   Next >>

Push the Next button again to see the discrete output terminals 51-63 and the status of the auxiliary relays on terminals 61 through 72. The wiring schematic will tell you which auxiliary relays are being used, and what they are driving.
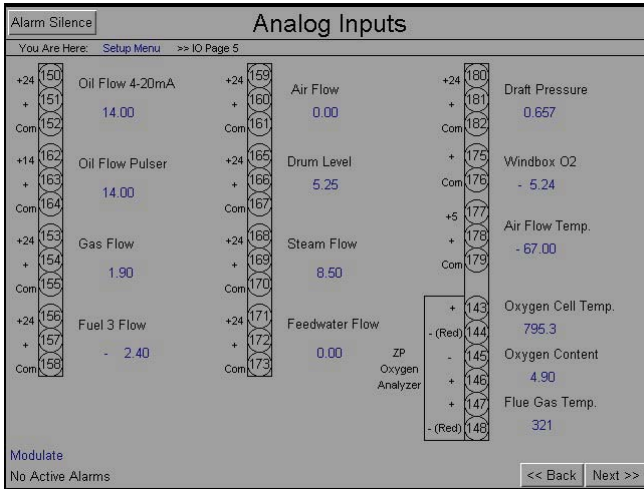
Alarm Silence
You Are Here: Setup Menu   >> IO Page 3

Discrete Outputs

51 Ignition Transformer
52 Pilot Gas Valve
53 Atom Media Valve
54 Oil SSOV
55 Oil Gun Post Purge
56 Gas / Leak Test Upstream SSOV
57 Fuel 2 / Leak Test Downstream SSOV
58 Fuel 2 Leak Test Vent Vlv
59 Option Relay 1
60 Lockout Alarm
63 Option Relay 2
61
62 FD Fan Motor Start

64
65 Option Relay 3
66
67
68 Option Relay 4
69
70
71 Option Relay 5
72

= Open Circuit
= Closed Circuit
= 120 VAC
= 0 VAC

Modulate
No Active Alarms   << Back   Next >>

Push the Next button again to see the status of the analog inputs on terminals 100 through 131.

Alarm Silence
You Are Here: Setup Menu   >> IO Page 4

Analog Inputs

+24 100
+ 101   Scanner 1 Flame Intensity
Com 102   61
+24 103
+ 104   Scanner 2 Flame Intensity
Com 105   0
+24 108
+5 109   Boiler Outlet
+ 110   70.0
Com 111
+ 112   Remote Firing Rate
Com 113   16.5

+5 114
+ 115   Outdoor Air Temp.
Com 116   - 67
+ 117
- 118
+ 127   FD VSD 4-20mA FB
Com 128   39.08   Out   39.07
+ 130   Aux 2 4-20mA FB
Com 131   0.08   Out   0.00

Modulate
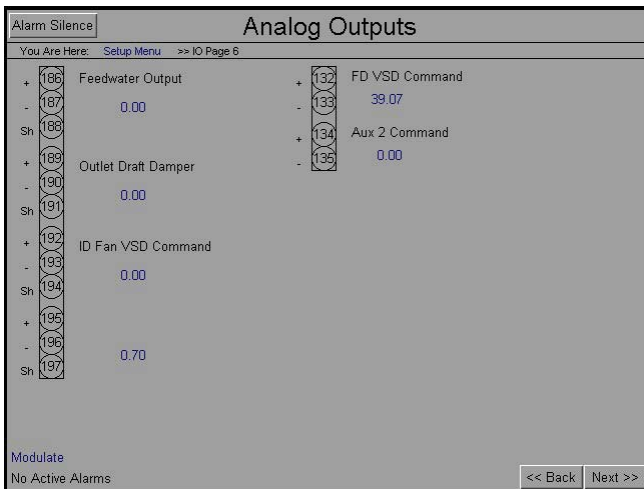No Active Alarms   << Back   Next >>

BMU TOUCHSCREEN OPERATION

Push the Next button again to see the status of the analog inputs on terminals 150 through 179 including the oxygen analyzer terminals on 143 through 148.
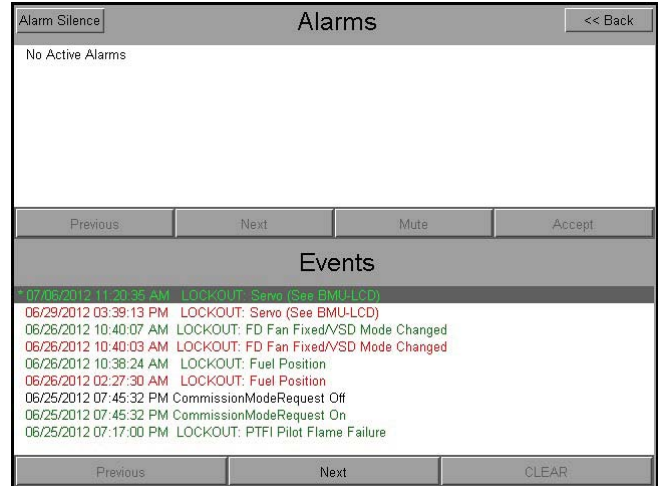

Push the Next button again to see the rest of the analog outputs.

These screen provide very useful operating information, as well as trouble-shooting information. **They are all read only.**
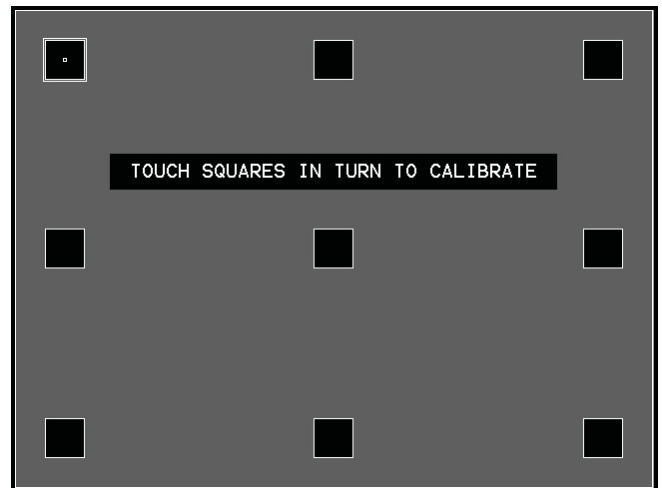
Alarm Page

The Alarm Page screen shows the status of active alarms on the top, and a log of all the BMU controller events on the bottom. The Next and Previous buttons can be used to scroll through the alarm and event history.

Touch Screen Calibration

Sometimes the soft buttons on the interior of the touch screen don't seem to work especially the buttons with small boxes. If this is the case, go to Setup Menu then System Setup and then Calibration in the middle of the screen. Touch the center of the nine boxes to calibrate the touch screen and the response should be improved.

TROUBLESHOOTING THE BMU

The BMU is capable of informing the operators of its condition. Both the LCD keypad and the color touch screen relay a lot of useful information to help diagnose a problem.

Responding to an alarm

If the BMU is sounding the common alarm (the LCD keypad display will be blinking, a horn or bell will be going off) look on the LCD keypad or the bottom of the color touchscreen for the cause of the alarm. The BMU can be configured to sound the alarm if one of several values gets too high or too low. For instance, the BMU can generate both a high water level and a low water level alarm for a boiler. Many alarms will sound the horn and make the LCD keypad flash, but not shut down the boiler. The BMU is trying to get your attention to notify you something is out of range. The Alarm Silence pushbutton on the LCD keypad and on the color touchscreen will silence the horn, but will not clear the alarm. Note if you silence the alarm and the condition comes back, the alarm will sound again.

Responding to a Lockout

If the BMU senses an unsafe operating condition, it will shut down the burner and go into the BMS state referred to as Lockout. A Lockout can't be cleared until the condition that caused the lockout goes away, and the BMU is reset from the LCD keypad. The following conditions are considered unsafe and will cause a Lockout.

Loss of flame signal

Any burner limit opens (and the digital input on the BMU is de-energized)

Certain analog inputs get too far out of range (low stack oxygen, high stack temperature)

Any servo is out of its commanded position.

Any VSD is not at its commanded speed.

Any internal fault within the BMU indicating a failed processor.

The following steps should be taken to respond to a Lockout:

1. Push the Alarm Silence button on the LCD keypad or color touchscreen to silence the horn or bell and stop the flashing.

2. Read the screen to determine the cause of the Lockout.

3. Investigate the reason for the Lockout and take proper corrective action. You might go to the Lockout Data screen to see if this type of Lockout has occurred before. The Lockout Data screen contains other information from the time of the Lockout that might help diagnose a problem. The System I/O screen can be used to see if the condition that caused the Lockout has cleared.

4. Only after you have determined the cause of the Lockout, taken corrective action, and determined the condition has cleared and it is safe to operate the burner should you push the Reset button and light off the burner again.

TROUBLESHOOTING THE BMU

Common Trouble-Shooting Tips

LCD Keypad

Condition: The LCD keypad is blank or unresponsive

(This indicates a lack of communication with the BMU chassis)

Corrective Action:

1. Check to make sure there is power to the BMU chassis. There are red LEDs on each side of the chassis that blink when the unit has power.

2. Check to make sure the orange terminal block is plugged into the back of the LCD keypad.

3. Check to make sure the orange terminal block from the LCD keypad is plugged into the BMU chassis.

4. Do a pull test on the wires coming out of the green cable as they terminate to each orange terminal block.

5. Call your Preferred representative or technician. The ribbon cable on the back of the keypad may need to be unplugged and plugged in again.

Color Touchscreen

Condition: The touch screen is blank and the red PWR LED is on.

Corrective Action:

1. If the red PWR LED is on but the screen is blank, push one of the hard buttons on the left hand side of the touch screen. The touch screen may have gone into screen saver mode. This can be turned off by going to Setup Menu, then System Setup, and adjusting the Display Off Seconds.

2. If the red PWR LED is on but the screen is blank, adjust the Backlight Brightness and LCD Contrast in the same System Menu screen.

3. If adjusting neither of these settings causes the touch screen to come on, call your Preferred representative or technician. The screen may have a bad back light.

TROUBLESHOOTING THE BMU

Color Touchscreen Cont'd:

Condition: The touch screen is blank and the red PWR LED is off.

(This indicates a loss of 24 VDC power to the touchscreen)

Corrective Action:

1. Check to make sure the power plug at the bottom of the touchscreen is still plugged in.

2. Check to make sure there is 24 VDC power coming out of the power supply.

3. Check to make sure there is 120 VAC power to the BMU.

4. If there is power to the touchscreen, but the screen and the red PWR LED are off, call your Preferred representative or technician.

Condition: The touch screen is on but there are dashed lines across all the values.

(This indicates a loss of communication with the BMU chassis)

Corrective Action:

1. Check to make sure the communication cable is plugged in to the touch screen and the OIT adapter.

2. Make sure the orange terminal block is fully plugged into Com 1 of the BMU chassis.

3. Do a pull test on the wires on the OIT adapter and the terminal block on Com 1 of the BMU chassis.

4. If the wiring between the touchscreen and the BMU chassis looks intact, call your Preferred representative or technician. One of the communication settings may have been changed.

TROUBLESHOOTING THE BMU

Flame Scanner

Condition: The BMU locked out on flame failure. Each time the burner tries to light off it trips on PTFI flame failure.

(This indicates the flame scanner is not seeing flame)

Corrective Action:

1. Inspect the scanner. Make sure the left hand LED is on. If none of the LEDs are lit, the scanner may not have 120 VAC power. Check the scanner wiring.

2. Unscrew the scanner from the scanner mount. Visually inspect the sight tube to ensure there are no blockages. Make sure the scanner window is not sooted up.

3. If the scanner mount is adjustable, make sure the scanner mount has not moved out of position. The scanner may need to be re-aligned.

4. With the burner off, put a cigarette lighter flame in front of the scanner and see if the right hand LED comes on. This indicates the scanner is working properly.

5. Try to light off the burner again. If the right hand LED on the scanner comes on, check for 120 VAC power on BMU terminal 30. Lack of power on terminal 30 indicates a wiring problem to the scanner.

6. Call your Preferred representative or technician. The scanner could have failed.

*Note: BMU ultraviolet self-check scanners can fail during their self-check operation. If this is the case, the left-hand LED will be solid red, but the right hand LED will not come on regardless of flame intensity. This indicates a failed scanner and it should be replaced.

BMU Servo

Condition: The BMU locked out and displays a servo out of position error.

Corrective Action:

1. Reset the BMU and try to light off again. The BMU will perform a servo check. If the servo check is successful the burner will light off and function normally.

2. If servo check fails and the same servo is reported out of position, remove the cover from the servo and check to ensure the lights are on the red servo controller board. If the lights are not on, do a pull test on the small gauge wires plugged into the green terminal block. Check the servo wires on the BMU chassis as well.

3. If the lights are lit on the red servo board, check for 120 VAC power on the black terminal strip. Lack of power here indicates a blown fuse or a loose wire in the power circuit to the servos.

4. If there is 120 VAC power on the black terminal strip, check the fuse just under the terminal strip.

5. Remove the J11 jumper just under the green terminal block. If you hear the servo motor trying to move, the device it is driving may be stuck.

6. If you jog the servo and the motor doesn't try to move, call your Preferred representative or technician. The servo may need to be recalibrated, or it may have failed.

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